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HUNGARIAN VETCH.[1]

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CONTENTS.

	Page.		Page.
Introduction of Hungarian vetch	1	Use of lime and gypsum	8
Description	2	Harvesting for hay	8
Longevity and hard seed	2	Harvesting for seed	9
Climatic requirements	2	Threshing	9
Soil and moisture requirements	4	Cleaning seed	10
Value for hay	5	Yield of seed	10
Value for green manure	6	Insects in relation to pollination	10
Value for pasturage	7	Insect enemies	11
Time and rate of seeding	7	Fungous diseases	11
Method of seeding	7	Nematode injury	11
Inoculation	8		

INTRODUCTION OF HUNGARIAN VETCH.[2]

Hungarian vetch is a native of central and southern Europe, being quite abundant in Hungary and adjoining territory. It has been introduced into cultivation in parts of Europe, but nowhere does it seem to have been grown to any great extent. European seedsmen offer the seed for sale, but usually only in small quantity. The crop has been most extensively tested in the Pacific Coast States, where it is especially well adapted. In experimental tests in the Southern States it has done well except in plantings where it has been affected by nematodes. Its winter hardiness, resistance to aphids, good seed habits, and adaptation to poorly drained lands make it desirable for extended trial throughout the Cotton Belt. It was first introduced into the United States by the Bureau of Plant Industry of the United States Department of Agriculture in 1905 under S. P. I. No. 17027.[3] The seed bearing this number was secured through Haage & Schmidt, of Erfurt, Germany. A number of introductions have been made since that time. The seed used most in experimental work and the kind that is being increased for commercial use was received from Vilmorin-Andrieux & Co., Paris, France, in 1912, under S. P. I. No.

[1] *Vicia pannonica.*

[2] The experiments with Hungarian vetch in Oregon since 1915 have been carried on in cooperation with the Oregon Agricultural Experiment Station at Corvallis, and it is largely as a result of this work that the commercial importance of the crop has been recognized.

[3] The accession number assigned to the seed when received by the Office of Foreign Seed and Plant Introduction.

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34372. There have been no noticeable differences in the plants from the different introductions. At the present time (1923) a few farmers in western Oregon have Hungarian vetch planted in commercial acreages. Seed has not been available previously for large acreage plantings.

DESCRIPTION.

Hungarian vetch is much less viny than common vetch or hairy vetch. The plants are semidecumbent or ascend with support. Both the stems and the leaves have a covering of medium-long hairs which give the plants a decided grayish color. Under average conditions the stems attain a height of 2 to 2½ feet. The leaves have three or four pairs of linear leaflets, which are from three-fourths to 1 inch long. From one to six, usually three or four, cream-colored flowers are borne in a cluster. The standard, or largest, petal has a few brown-colored stripes, and the keel, or smaller and inner petals, is usually greenish brown. The plump pubescent or hairy pods contain an average of four seeds each. These are mottled grayish brown and are round or somewhat flattened on account of being compressed in the pod. (Figs. 1 and 2.)

LONGEVITY AND HARD SEED.

Seed of Hungarian vetch retains its vitality under average conditions for a number of years. Germination tests made at Corvallis, Oreg., show that locally grown seed of different years germinates well in all cases and that it retains its vitality with little or no decrease through a five-year period. A test in 1921 of seed grown in 1912 at Chico, Calif., gave 60 per cent germination and no hard seed. In the tests at Corvallis even the 1-year-old seed never contained more than 1 per cent of hard seed. Table 1 gives the results of these tests.

TABLE 1.—*Percentage of germination and hard seed in Hungarian vetch*[1] *grown at Corvallis, Oreg., and Chico, Calif., in various years from 1912 to 1921.*

Age.	Dates.	Germination test.				Where grown.
		Seed.	Days.	Germination.	Hard.	
				Per cent.	*Per cent.*	
1 year	1919–20	100	21	99	½	Corvallis, Oreg.
3 years	1917–1920	100	21	98	1	Do.
4 years	1916–1920	100	21	98½	½	Do.
5 years	1915–1920	100	21	97	1	Do.
9 years	1912–1921	50	7	60	0	Chico, Calif.

[1] Tests were made in duplicate.

CLIMATIC REQUIREMENTS.

An equable and comparatively cool growing season is essential for Hungarian vetch to attain its maximum development. It should be sown in the fall in regions having a winter temperature not lower than 10° F. above zero as the usual minimum. In colder areas it should be grown as an early-sown spring crop. Hungarian vetch can not stand hot weather at any time. In its early stages

FIG. 1.—Habit picture of *Vicia pannonica:* 1, Stems in flower, one-half natural size; 2, pods, natural size; 3, flower, magnified one-half diameter; 4, calyx, magnified one-half diameter; 5, pistil, magnified one-half diameter; 6, stipule, magnified one-half diameter; 7, seed, natural size; 8, seed scar, magnified 5 diameters.

of development hot weather retards the growth of the plants, and in its later development it checks both the growth of the plant and the development of seed. While Hungarian vetch stands colder winters than common vetch (*Vicia sativa*) it is not as winter hardy as hairy vetch (*Vicia villosa*). In experimental plantings at Raleigh, N. C., Knoxville, Tenn., Fayetteville, Ark., Athens, Ga., Auburn, Ala., and other places in the South it has proved entirely winter hardy. At the Arlington Experimental Farm in Virginia it survived the winters specified below with the following minimum temperatures: 1915–16, 6° F.; 1917–18, 3° F.; 1918–19 and 1920–21, 11° F.; 1921–22, 25° F. It winterkilled in 1919–20 with a minimum of 8° F.

FIG. 2.—Hungarian vetch in full bloom.

The accompanying map (fig. 3) shows the region to which Hungarian vetch is adapted for seeding as a fall crop. In regions in which spring planting is essential vetches seldom do well, and it is only under special conditions that their planting can be advised.

SOIL AND MOISTURE REQUIREMENTS.

One of the most striking features of Hungarian vetch is its ability to grow on heavy wet lands and still produce a fair crop. (Fig. 4.) It will stand much wetter soil conditions than common vetch or hairy vetch. In experimental tests at Corvallis, Oreg., it has done quite well on poorly drained "white land" on which common vetch would not survive. While this vetch does better than others on wet lands, it makes its best growth on a good loam soil that is well drained. It also seems to stand dry weather as well as any other of the vetches, but none is adapted to such conditions.

VALUE FOR HAY.

There have been no feeding tests of Hungarian vetch hay to determine its relative value in comparison with common vetch or other hay, but probably it is comparable to common vetch in this respect. Hay made from this vetch has been fed to dairy cows at Corvallis, Oreg., and they consumed it readily with no waste. The heavy pubescence of Hungarian vetch gives the hay a light-colored appearance. For this reason it might be objected to in some markets. The pubescence in no way should interfere with the feeding quality of the hay, and the lighter color should not be objectionable. In comparison with other forage crops Hungarian vetch yields well. In Tables 2 and 3 are shown the yields of hay secured from plat

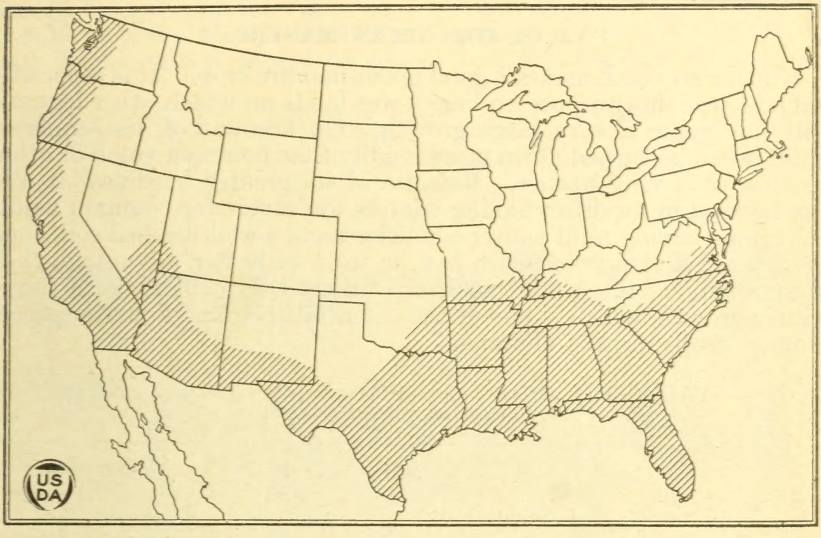

FIG. 3.—Outline map of the United States, the shaded area showing the region in which Hungarian vetch should be fall sown.

plantings at Corvallis. These range from 2 to a little over 3½ tons per acre.

TABLE 2.—*Yield of Hungarian vetch sown at Corvallis, Oreg., November 1, 1920, at different rates in duplicate fortieth-acre plats.*

Rate of seeding per acre.	Stand.	Yields per acre.		
		Hay.	Seed.	Straw.
	Per cent.	*Tons.*	*Pounds.*	*Tons.*
20 pounds	100	2.02	600	1.41
40 pounds	100	2.43	1,320	2.04
60 pounds	100	2.32	1,420	2.48
80 pounds	100	2.63	1,580	2.79
100 pounds	100	2.54	1,180	2.94

In Tables 4 and 5 are shown the yields of straw secured in connection with seed yields of Hungarian vetch. These indicate a vigorous growth and a production of hay equal to that given in the previous tables.

TABLE 3.—*Yield of Hungarian vetch and gray winter oats sown at Corvallis, Oreg., November 1, 1920, at different rates in fortieth-acre plats replicated four times.*

Rate of seeding per acre.	Stand.	Yields per acre.			
		Hay.	Seed.		Straw.
			Vetch.	Oats.	
	Per cent.	*Tons.*	*Pounds.*	*Pounds.*	*Tons.*
Vetch, 20 pounds; oats, 40 pounds	100	2.15	320	1,080	3.36
Vetch, 40 pounds; oats, 40 pounds	100	2.58	600	1,000	3.06
Vetch, 60 pounds; oats, 40 pounds	100	2.88	680	880	2.94
Vetch, 80 pounds; oats, 40 pounds	100	3.04	840	880	3.04
Vetch, 100 pounds; oats, 40 pounds	100	3.60	960	800	3.28

VALUE FOR GREEN MANURE.

Hungarian vetch makes a good green-manure crop. It is especially valuable for this purpose on heavy wet lands on which other legumes will not make a very large growth. On account of its semierect habit it can be turned down more readily than common vetch or other vetches of a viny nature. Because of its greater hardiness it also can be used in localities having winters too severe for common vetch. In regions having mild winter conditions and a well-drained soil, common vetch and purple vetch can be used to better advantage than Hungarian vetch. Under such conditions they will make a larger winter growth, which is one of the essential features of winter green-manure crops in mild climates.

TABLE 4.—*Yield of Hungarian vetch sown at Corvallis, Oreg., March 9, 1921, at different rates in duplicate fortieth-acre plats.*

Rate of seeding per acre.	Yields per acre.		
	Seed.		Straw.
	Vetch.	Oats.	
	Pounds.	*Pounds.*	*Tons.*
Vetch, 80 pounds	770	.....	1.82
Vetch, 100 pounds	940	.....	1.83
Vetch, 80 pounds; oats, 40 pounds	640	2,470	2.35
Vetch, 100 pounds; oats, 40 pounds	760	2,300	2.25

TABLE 5.—*Yield of seed and straw of Hungarian vetch fall sown at Corvallis, Oreg., in duplicate twentieth-acre plats, 1916 to 1921, inclusive.*

Year harvested.	Planting date.	Stand.	Harvesting date.	Yields per acre.	
				Seed.	Straw.
		Per cent.		*Pounds.*	*Tons.*
1916	Nov. 4	100	Aug. 8	1,730	.....
1917	Nov. 14	100	July 30	1,450	2.12
1918	Oct. 29	100	July 15	2,118	2.74
1919	...do.....	100	July 20	2,540	2.98
1920	Oct. 7	100	July 22	2,700	3.28
1921	Nov. 1	100	July 20	2,560	2.83

VALUE FOR PASTURAGE.

Livestock of all kinds consume Hungarian vetch readily in the green state, and it can be pastured under all conditions where other vetches can be used. It is most useful, however, in temporary pastures. Its feeding quality is excellent, and stock of all kinds will do well when fed with vetch alone or vetch in mixture with other pasture plants. Aside from being a good plant for stock pasturage, it also makes excellent bee pasture. The flowers and stipule glands seem to secrete an abundance of nectar, and bees visit the fields in great numbers.

TIME AND RATE OF SEEDING.

In all regions having mild winter conditions Hungarian vetch should be sown in the fall. In the southwestern United States it should be sown about the first of September. In western Oregon and Washington it should be seeded with the first fall rains during

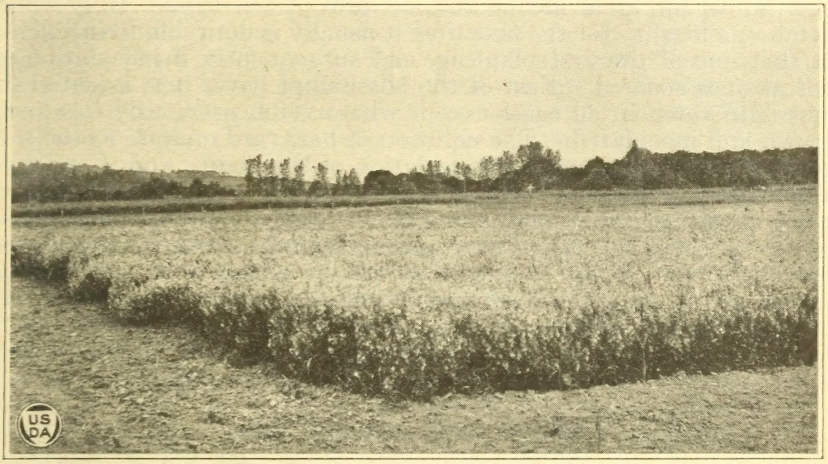

FIG. 4.—A field of Hungarian vetch in full bloom on wet "white land."

September and October. In regions having severe winters plantings made as early in the spring as the ground can be worked will give the best results, though this vetch is not recommended for growing under such conditions.

In experimental plantings at Corvallis, Oreg., the best rate of seeding has been 80 pounds of vetch seed alone and 80 to 100 pounds of vetch and 40 pounds of oats. The results of these experiments are presented in Tables 2 and 3 for both seed and hay yields. In extensive experiments with common vetch at Corvallis 80 pounds of seed per acre has been found to be the most desirable rate of seeding, and it would seem that Hungarian vetch is very similar to common vetch in this respect. In Table 4 are shown the results of a spring-seeding test at the rates of 80 and 100 pounds of seed per acre. In this case the 100-pound rate gave the highest seed yields.

METHOD OF SEEDING.

There has been no experimental work done to determine the best method of seeding Hungarian vetch. Experiments with common

vetch have indicated a saving of seed by the use of a drill, and somewhat heavier yields of both hay and seed have been obtained by this method of seeding. Some growers have contended that drilled vetch winterkills less than broadcasted plantings, but we have not been able to demonstrate in our experimental work that there is any material difference. Good stands have been secured in loam soils from plantings 4 inches in depth. Deeper plantings than this have resulted in poorer stands, while shallower plantings have always given good stands when sufficient moisture was present. The surface-moisture condition should determine the depth of planting, which in most soils should not exceed 4 inches.

INOCULATION.

Hungarian vetch is inoculated by the same organism that inoculates common and hairy vetch. In considerable areas of the Pacific Coast States the inoculation of vetch does not seem necessary. However, in certain areas inoculation has proved beneficial. In growing vetch in a locality for the first time it usually is desirable to inoculate at the time of the first planting, and subsequently if inoculation is not at once secured. East of the Mississippi River it is essential to inoculate vetch in all cases except where vetch previously has been grown and inoculated. The addition of barnyard manure to the soil greatly aids in securing the inoculation of the plants, and it is desirable whenever possible to add 8 or 10 tons of manure per acre to land being seeded to vetch for the first time. Inoculation can be secured either by using soil taken from an inoculated field or by the use of pure cultures. If soil is used this can be mixed with the seed or spread on the land and harrowed in immediately before seeding. If the soil is mixed with the seed only a small quantity is needed, but if spread on the land about 600 pounds per acre will be required. When a pure culture is used this is always added to the seed.

USE OF LIME AND GYPSUM.

Like most other vetches, Hungarian vetch will grow on acid soils about as well as any crop. It seems to be somewhat more tolerant of acid conditions than common vetch. However, a neutral soil is best for Hungarian vetch, and in the case of acid soils this can be obtained by the use of lime. In western Oregon and Washington it is common practice to make applications of gypsum in connection with vetch and other legume crops, but the use of lime has not been found profitable. In many regions having acid soil conditions lime at the rate of 1,000 to 3,000 pounds per acre and gypsum at 50 to 100 pounds per acre can be used advantageously.

HARVESTING FOR HAY.

Hungarian vetch should be cut for hay at about the time the last flowers are in bloom. At this time the lower pods are from one-half to two-thirds filled. In this condition the plant is at its best for hay, and while the maximum weight that the plant is capable of producing may not be obtained the maximum quantity of a most digestible and palatable hay is produced. If cutting is delayed until the lower pods are practically ripe, the seeds mature in the curing hay and are

not digested by livestock. After cutting, the hay should be put in the windrow and shocked as soon as possible. It should not be allowed to become too dry, as in this condition there is a loss of leaves and small branches in handling. Hungarian-vetch hay when handled properly can be cured so that its color is practically the same as when green. This color is very difficult to obtain with any other variety of vetch. When the vetch is grown with a small-grain crop it should be cut for hay at the time it is in the condition just described. At that time the grain will be in the milk or early soft-dough stage and will make good hay. Some growers make a difference in the time of cutting vetch or vetch and grain hay, according to the class of livestock to be fed. For horses it usually is allowed to get riper than for either cattle or sheep.

HARVESTING FOR SEED.

The seed habits of Hungarian vetch are much better than those of common or hairy vetch. The crop does not shatter readily, but some precautions must be taken in harvesting or a greater or less quantity of seed will be lost. The vetch should be cut for seed when the pods on the lower half of the plant are ripe. At this time the plants will be carrying the maximum number of seeds. The seed crop at Corvallis, Oreg., usually has been harvested from July 15 to July 30. In cutting, either a reaper or an ordinary mower with swather attachment can be used. On account of the nonshattering habits of the seed pods there usually is but little seed lost in using the mower with a swather attachment, and this perhaps is the fastest way. After cutting, the vetch should be put into good-sized shocks and allowed to remain until thoroughly dry and ready for threshing. If the thresher is not available at once it is advisable to stack the crop rather than to allow it to remain in the field in the shock. If the vetch has been sown with a grain crop and only a small growth made, the crop can be harvested fairly satisfactorily with a binder. When using the binder, however, the vetch should be cut a little greener than otherwise would be the case, as there will be some shattering of the pods caused by the canvases and packers.

THRESHING.

An ordinary grain thresher can be used for Hungarian vetch when grown alone or in combination with a small grain. Vetches thresh somewhat slowly, and the cost per bushel is much greater than in the case of either wheat or oats. The charge for threshing vetch seed is usually by the hour. It is sometimes necessary, in order to prevent cracking the seed, to remove a number of the concave and cylinder teeth of the thresher and to reduce the speed of the cylinder one-fourth, or to about 900 revolutions per minute. The adjustments that may be necessary seldom can be told beforehand and must be determined by the appearance of the threshed material as it comes from the machine. The screens that come with ordinary grain threshers can be used by properly adjusting them. However, the seed as it comes from the thresher will not be sufficiently clean for marketing and will have to be run through special cleaners in order to secure a first-class product.

CLEANING SEED.

Hungarian vetch seed as it comes from the thresher will contain more or less cracked seed, small straws, weed stems, chaff, and the small grain with which it may have been grown. Ordinary fanning mills and seed cleaners that usually are available on farms or at warehouses will separate readily most of the foreign matter and trash from vetch. These machines will also separate quite readily the seeds of vetch and of oats or barley, but wheat and rye seeds are not so readily separated from vetch seed. Separation can be satisfactorily accomplished by the use of a gravity spiral seed separator, such as recently has come into general use in the various regions growing vetch seed.

YIELD OF SEED.

In comparison with common vetch and hairy vetch Hungarian vetch produces a heavy seed yield. At Corvallis, Oreg., it not only has given heavy yields of seed, but it has been a consistently good producer through a series of years. In Tables 2, 3, 4, and 5 are given the seed yields of Hungarian vetch when sown at different rates of seeding alone and in combination with oats and also when fall and spring sown. In Table 5 the yields secured in the various seasons from 1916 to 1921 are presented. The largest seed yields, ranging from 1,450 to 2,700 pounds per acre, have been obtained from fall seeding. The largest yield in the rate-of-seeding tests was secured from the planting made at the rate of 80 pounds of seed per acre. When Hungarian vetch was planted with oats at different rates of seeding the largest yield of vetch was secured from the seeding of 100 pounds of vetch and 40 of oats, but in the seeding at the rate of 80 pounds of vetch and 40 pounds of oats a larger yield of oats was obtained, though the vetch yield was smaller. The yields from spring planting, as given in Table 4, are small in comparison with those from fall planting. While Hungarian vetch has not given very large yields in spring plantings, it has done as well as any other vetch when planted at that season of the year. In addition to the plat plantings made at Corvallis in the fall of 1920, there was one increase field of $1\frac{1}{10}$ acres sown at the rate of 80 pounds of seed per acre. This was on what is known as "white land," which is considered of decidedly inferior quality. This planting in the season of 1921 yielded 2,099 pounds of seed, or at the rate of $31\frac{1}{3}$ bushels per acre, calculating 60 pounds of seed to the bushel.

INSECTS IN RELATION TO POLLINATION.

During the seasons from 1915 to 1921 a series of experiments was conducted to determine the relation of the tripping of the flowers and the visits of insects to seed setting. By tripping is meant the forcing of the staminal column out through the keel or inner petals of the flower, such as would be accomplished by the visitation of certain insects. With many plants this process is accompanied by cross-fertilization. The flowers on plants inclosed in fine-mesh netting cages were counted, and a part of these were tripped artificially, while the others were allowed to remain untripped. The results of these trials are given in Table 6. It will be noted that there was a considerable increase in the percentage of pods set in the case of the tripped flowers, indicating that the tripping was beneficial to seed setting.

TABLE 6.—*Effect of tripping flowers on the setting of seed of Hungarian vetch at Corvallis, Oreg., 1915 to 1921, inclusive (except 1917).*

Year.	Flowers tripped.			Flowers not tripped.		
	Total number.	Number setting pods.	Percentage setting pods.	Total number.	Number setting pods.	Percentage setting pods.
1915	65	25	39.5	65	8	12.3
1916	72	36	50	72	12	16.6
1918	21	16	76	18	6	33
1919	174	125	71	322	93	28
1920	125	93	73	160	58	36
1921	95	76	80	80	48	60
Total	552	351	63.6	717	225	31.3

In order to determine whether or not cross-pollination is essential to seed setting in Hungarian vetch, a number of flowers were inclosed in paper bags so as to exclude even small insects, such as thrips, which had ready access to the cages used in the tripping experiment. The flowers thus inclosed set a smaller percentage of pods than the untripped flowers in the cages. However, in only one season out of seven was the percentage sufficiently low to indicate sterility in any way. While the results of these experiments indicate that Hungarian vetch is self-fertile and will set seed readily without the intervention of insects, it also seems apparent that the visitation of insects that trip the flowers results in an increased seed production.

INSECT ENEMIES.

There are no insects that have done serious damage to Hungarian vetch. In seasons when common vetch and other vetches have been seriously attacked by aphids, Hungarian vetch has suffered little or no damage. It seems to be quite immune to attack by these insects, at least when it is growing in association with other crops on which the aphids can feed.

FUNGOUS DISEASES.

In so far as Hungarian vetch has been grown in the United States it has not been attacked by any fungus, even when grown in close proximity to other vetches that were being more or less damaged. It apparently is more or less immune to the leaf-spot (*Mycosphaerella pinodes*) and false anthracnose (*Protocoronospora nigricans*). While this vetch has not as yet been attacked by any serious disease, it has not been grown extensively enough to say to just what extent it may be immune.

NEMATODE INJURY.

In experimental plantings at Auburn, Ala., Tifton, Ga., and McNeill, Miss., root-knot nematodes (*Heterodera radicicola*) were found on Hungarian vetch, apparently doing considerable damage. To what extent this infestation will interfere with the growing of this variety in the Southern States has not yet been determined; it perhaps will exclude its use in the sandy Coastal Plain area. In the western United States no damage from nematodes has as yet been noted.

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